Enec 259 Lesson Plan
Coral Transplantation

Agenda:

1) Brief presentation on the basics of coral
2) Introduce the idea of coral transplantation
3) Explanation of science behind it
4) Examples of scientists using coral transplantation
5) Short video
6) Quiz to check knowledge

Focus Questions:

1) Why do coral reefs matter?
2) What is the current situation surrounding coral reefs?
3) What are corals? Where do they come from?
4) What is the scientific community doing to help?

Summary of Material:

Coral reefs are one of the greatest centers of biological diversity on the planet, accounting for a 25% of the ocean species, and harbor a great amount of economic value. It is actually estimated to be worth $375 billion dollars, given its many benefits such as ecotourism, medical services, and shoreline protection. Current conditions are endangering the reefs, and human involvement in that is undeniable. Pollution coming from the coast are mostly sewage, fertilizers and oil, these have led to a sharp increase in toxins and disease present in the coral reefs. Global climate change has been changing the chemistry of the ocean and also risen its temperature. Non-human factors include El Nino, which this year specifically has caused significant damage to coral reefs. The combinations of all these factors have led to the longest coral bleaching event in history, threatening the entirety of the Great Barrier Reef. In addition, these threats are all positive feedback loops, meaning each factor enhances the other factors and itself. Without seriously efforts to conserve and replenish coral populations, these reefs are in grave danger.

Corals themselves are simply fatty polyps and are classified as animals. It is the symbiotic relationship with an algae, called zooxanthellae, that allows it to use light as a energy source. Coral bleaching, the main indicator of stress for corals, is simply the expulsion of that algae. However, the lifecycle of the actual coral polyp shows the resilience of the creature. Corals reproduce by releasing their eggs and sperm into the water column, where they fertilize.

Then they expand into the small fatty polyp that I mentioned earlier, and must find a substrate onto which to attach. The process through which polyps "decide" where to attach is the one of the most important features of coral transplantation. Coral polyps actually can sense light, sound, pH, chemicals, textures, colors and pressure waves. There are certain environments that polyps prefer over others, and this is due to the selection process using those senses. Of course once attached, the corals grow into colonies and form the calcium carbonate structures that you think of when thinking of corals.

Current efforts to manage coral populations are still mainly centered around conservation. However, there has been a new rehabilitation approach to coral management, and that is coral transplantation. Coral transplantation is based upon the study of were corals prefer to settle and what factors can we manipulate in order to put the corals in the best place possible. Studies have shown that corals prefer to attach to the colors associated with healthy reefs, white and pink, and also in small cracks to avoid damage. In addition, several bacteria have been proven to promote coral polyp attachment. Coral transplantation itself is the actual capture and raising of coral embryos. Once healthy, the corals are placed back into the reefs using the guidelines of preferred attachment locations. In the video, Kristen Marhaver talks about her own experience with coral transplantation and its significance. The main limitations to this type of work is generally funding and manpower, and both those problems could be solved with an increase in interest. So the best way to help the future of the reefs is to get informed and get involved.

Video Material:
http://www.ted.com/talks/kristen_marhaver_how_we_re_growing_baby_corals_to_rebuild_reefs

Final Quiz:
What is the estimated economic value of the coral reefs?

A. $375 million
B. $37 billion
C. $375 billion
D. $200 million

What can coral **not** sense?

A. Light
B. Pressure
C. pH
D. None of the above

What do current coral management methods center around?

A. Renovation
B. Rehabilitation
C. Conservation
D. None of the above

What colors of healthy reefs do coral polyps prefer to attach to?

A. White
B. Pink
C. Black
D. A &B
E. All of the above

An increase is what factor could help coral transplantation research the most?

A. Manpower
B. Funding
C. Interest
D. None of the above

Key
1. C
2. D
3. C
4. D
5. C